General

Guideline Title

Risk of acute hyponatremia in hospitalized children and youth receiving maintenance intravenous fluids.

Bibliographic Source(s)

Friedman JN, Canadian Paediatric Society, Acute Care Committee. Risk of acute hyponatremia in hospitalized children and youth receiving maintenance intravenous fluids. Paediatr Child Health. 2013 Feb;18(2):102-4. [30 references]

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

The following recommendations apply to the prescription of intravenous (IV) maintenance fluids in children one month corrected age to 18 years of age, excluding patients with renal or cardiac disease, diabetic ketoacidosis, severe burns or other underlying conditions that significantly affect electrolyte regulation.

General Principles

1. Any child in hospital who requires IV fluids should be considered at risk for developing hyponatremia due to increased risk of antidiuretic hormone (ADH) secretion. At particular risk are:
    - Children undergoing surgery
    - Children with acute neurological or respiratory infections (e.g., meningitis, encephalitis, pneumonia and bronchiolitis)
2. Oral fluids are generally very low in Na content (hypotonic). Where the total fluid intake (TFI) is a combination of oral and IV fluids, both need to be accounted for.
3. Because infants and young children have limited glycogen stores, dextrose should be part of the IV maintenance fluid prescription (e.g., 5% dextrose in water and 0.9% NaCl [D5W.0.9%NaCl] or 5% dextrose in water and 0.45% NaCl [D5W.0.45%NaCl]) if no other source of glucose is provided.
4. The approach to prescribing IV fluids should be as cautious as that for medications, with close attention paid to indications, monitoring, the type of fluid and the volume/rate of administration.

Monitoring

1. Baseline serum electrolytes (Na, K, glucose, urea, creatinine) should be measured when starting IV fluid therapy in hospitalized children.
2. Children receiving maintenance IV fluids should have their serum electrolytes checked regularly, with patients who may be at high risk of

impaired renal water excretion checked daily if not more frequently.
3. All children receiving IV maintenance fluids should have their intake/output carefully monitored, as well as a daily weight measurement.
4. Clinicians should be aware of the symptoms of hyponatremia, which may include headache, nausea and vomiting, decrease in level of consciousness, seizures and apnea.

Prescription of IV fluids for Maintenance Requirements

1. In children whose serum sodium is normal at baseline but who are considered to be at particularly high risk of ADH secretion (e.g., peri- or postoperative; with respiratory or neurological infections) the use of isotonic saline (D5W.0.9%NaCl) is recommended.
2. For other hospitalized children whose serum sodium is normal, the options are D5W.0.9%NaCl or D5W.0.45%NaCl. The first option is preferred, especially when the serum Na is in the low normal range (135 mmol/L to 137 mmol/L inclusive).
3. Hypotonic IV fluids containing <0.45% NaCl should not be used to provide routine fluid maintenance and should not be generally available on paediatric wards.
4. When serum electrolyte results are not yet available, it is recommended that D5W.0.9% NaCl be initiated as the maintenance IV fluid.
5. If the serum sodium is 145 mmol/L to 154 mmol/L, then D5W.0.45% NaCl should be initiated and frequent monitoring of the serum sodium performed.
6. Ringer's lactate is commonly used in the operating room but the absence of dextrose and presence of lactate make it generally inappropriate for maintenance IV therapy, especially in young children.

Intravenous (IV) Fluid Maintenance Recommendations Based on Plasma Na+ Level

Children One Month–18 Years of Age	**Recommended IV Fluid**
Na <138 mmol/L	Isotonic IV solutions
Na 138 mmol/ –144 mmol/L	Isotonic IV solutions preferred; half-isotonic solutions may be used
Perioperative period	Isotonic IV solutions

Note that these recommendations are not intended for use in infants and youth outside the one month to 18 year age group.

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Hospital-acquired acute hyponatremia

Guideline Category

Evaluation

Management

Prevention

Risk Assessment

Treatment

Clinical Specialty

Critical Care

Pediatrics

Intended Users

Advanced Practice Nurses

Hospitals

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

To outline current understanding of the problem of hospital-acquired acute hyponatremia and summarize recent research dealing with this issue

Target Population

Any child one month corrected age to 18 years of age in hospital who requires intravenous (IV) fluids and is at risk for developing hyponatremia due to increased risk of antidiuretic hormone (ADH) secretion

Note: Patients with renal or cardiac disease, diabetic ketoacidosis, severe burns or other underlying conditions that significantly affect electrolyte regulation are excluded.

Interventions and Practices Considered

1. Determining level of risk of antidiuretic hormone (ADH) secretion in hospitalized children
2. Use of dextrose as part of the intravenous (IV) maintenance fluid prescription
3. Use of caution in prescribing IV fluids, with close attention paid to indications, monitoring, the type of fluid and the volume/rate of administration
4. Measurement of baseline serum electrolytes (Na, K, glucose, urea, creatinine) when starting IV fluid therapy
5. Regular monitoring of serum electrolytes as well as intake/outtake in children receiving maintenance IV fluids
6. Clinician awareness of the symptoms of hyponatremia
7. Use of isotonic saline (5% dextrose in water and 0.9% sodium chloride [D5W.0.9%NaCl]) in children at increased risk of ADH secretion
8. Use of half-isotonic saline (5% dextrose in water and 0.45% NaCl [D5W.0.45%NaCl])
9. Avoiding hypotonic IV fluids containing <0.45% NaCl to provide routine fluid maintenance
10. Ringer's lactate (not generally recommended for routine fluid maintenance)

Major Outcomes Considered

- Serum Na level
- Risk of hyponatremia
- Risk of hypernatremia

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

A selective review of the relevant literature up until 2012 using PubMed was conducted. Specific search terms were not used; the author mainly looked at randomized controlled trials (RCTs) studying different intravenous (IV) maintenance fluids and their outcomes regarding acute hyponatremia, but some case control studies were also reviewed. Guidelines from various institutions and organizations were also incorporated.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Subjective Review

Rating Scheme for the Strength of the Evidence

Not applicable

Methods Used to Analyze the Evidence

Review

Description of the Methods Used to Analyze the Evidence

Not stated

Methods Used to Formulate the Recommendations

Not stated

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

This practice point has been reviewed by the Canadian Peadiatric Society's Community Peadiatrics Committee.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of evidence supporting the recommendations is not specifically stated.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- Appropriate prescription of intravenous (IV) maintenance fluids in hospitalized children one month to 18 years of age to avoid acute hyponatremia
- Recent studies suggest that, compared with hypotonic IV maintenance fluids, isotonic fluids decrease the risk of iatrogenic acute hyponatremia without significant side effects.

Potential Harms

Normal saline contains 154 mmol/L of Na, which is isotonic with respect to the cell membrane. This suggestion has raised concerns regarding the potential for hypernatremia and salt and water overload. However, unless the child has an impaired ability to excrete Na, a renal concentrating defect, significant water loss or prolonged fluid restriction, these risks appear to be largely theoretical. The risk of developing hyperchloremic metabolic acidosis has been recognized in the context of rapid isotonic saline infusion delivered perioperatively but has not been reported in the trials of intravenous saline used for maintenance requirements in children to date.

Qualifying Statements

Qualifying Statements

The recommendations in this position statement do not indicate an exclusive course of treatment or procedure to be followed. Variations, taking into account individual circumstances, may be appropriate. Internet addresses are current at time of publication.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Staying Healthy

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Friedman JN, Canadian Paediatric Society, Acute Care Committee. Risk of acute hyponatremia in hospitalized children and youth receiving maintenance intravenous fluids. Paediatr Child Health. 2013 Feb;18(2):102-4. [30 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2013 Feb

Guideline Developer(s)

Canadian Paediatric Society - Medical Specialty Society

Source(s) of Funding

Canadian Paediatric Society

Guideline Committee

Acute Care Committee

Composition of Group That Authored the Guideline

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Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available from the Canadian Paediatric Society Web site .

Availability of Companion Documents

None available

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on September 25, 2013.

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